Energy, Work and Power

Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Energy, Work and Power
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: **57 minutes**

Score: **/47**

Percentage: **/100**

1   (a (i)   Straight line through origin   B1

         (ii) Strain (energy) OR elastic (energy)   B1

     (b) Use of $1/2mv^2$ C1
          $0.5 \times 2.5 \times v^2 = 0.48$ C1
          $v^2 = 0.48/(0.5 \times 2.5)$ OR $v^2 = 0.384$ C1
          $v = 0.62\,m/s$ A1

                                                                                          [Total: 6]

2   (a   *mgh* OR $36 \times 10 \times 2.4$ [1]
         864 J OR N m (2 or 3 sig. figs.)   [1]

    (b) $(P =)$ *E/t* in any form, words, symbols or numbers OR 864 / 4.4   [1]
         196 W OR J/s (2 or 3 sig. figs.)   [1]

    (c) evidence that candidate understands the principle of energy conservation, expressed in
         words or as an equation (e.g. total energy is constant OR initial energy = final energy) or
         implied by statement accounting for difference   [1]

         some energy is dissipated into the surroundings OR difference due to increase in internal
         energy/heating/thermal energy (of belt, motor, surroundings) owtte
         note: do not accept kinetic energy / sound / friction if no mention of heating   [1]

    (d) increase in potential energy of mass is greater
         OR work done/energy used (to raise mass) is greater   [1]
         $t = E/P$ OR $P = E/t$ in any form, words or symbols AND power is constant   [1]
         speed reduced / time taken is longer   [1]

                                                                                          [Total: 9]

3 **(a** strain / elastic (potential) (energy)   **B1**

(b) **(i)** (KE =) $\frac{1}{2}mv^2$ in any form   **C1**

            1200 J   **A1**

   (ii) (G)PE (gained) = KE (lost) in any form   **C1**

            (G)PE = mgh OR $h = $ PE ÷ mg in any form   **C1**

            1.8 m   e.c.f. from **(b)(i)**   **A1**

  (iii) friction with air OR air resistance OR thermal energy / heat produced/lost   **B1**

(c) **(i)** limit of proportionality   **B1**

   (ii) Hooke's law   **B1**

4 **(a** kinetic (energy)   **B1**

(b) **(i)** (work done =) $F \times x$ in any form: words, symbols, numbers   **C1**
            1.4×10^9 J   **A1**

   (ii) work done = kinetic energy OR $\frac{1}{2}mv^2$ seen   **C1**
            $(v^2 =)2WD \div m$ OR $2 \times 1.4\,(4) \times 10^9 \div 4.5 \times 10^5$ OR 6400   **C1**
            80 m / s ecf **(i)**   **A1**

  (iii) (work done against) friction / (air) resistance / drag   **B1**
            ACCEPT energy converted to thermal energy

(c) perpendicular (to curved path) OR centripetal OR towards centre (of circle)   **B1**

[Total: 8]

5 (a lines from solar energy to boxes 1 AND 4 only   B1

       lines from natural gas to boxes 2 AND 3 only   B1

   (b) (relatively) cheap OR widely available OR can be used on a large scale
       OR always available   B1

   (c) (i) 2.05×10^9 N   B1

       (ii) use of mgh OR weight × h C1
             1.03×10^{12} J NOT ecf from (i)   A1

       (iii) output energy ÷ input energy OR $6.2 \times 10^{11} \div 1.2 \times 10^{12}$ C1
             0.52 OR 52 %   A

                                                                                               [Total: 8]

6 (a (g.p.e.=) mgh OR $75 \times 10 \times 880$ C1
       = 6.6×10^5 J / Nm OR 660 kJ / kNm

   (b)   (work =) Fs / Fd OR 220×2800 C1
           = 6.2×10^5 J / Nm OR 620 kJ / kNm

       (ii) answer to (a) – answer to (b)(i)   C1
             e.g. (k.e.=) $6.6 \times 10^5 – 6.2 \times 10^5 = 4.0 \times 10^4$ J OR 44 kJ
             OR $6.6 \times 10^5 – 6.16 \times 10^5 = 4.0 \times 10^4$ J OR 44 kJ

   (c) (to go faster by) reduced air resistance / drag / resistive force
       OR to lower centre of mass OR increase stability / balance

                                                                                               [Total: 7]